A REVIEW OF THE GENUS MYRMOTERAS (HYMENOPTERA, FORMICIDÆ)[1]

By William S. Creighton

Among a number of archaic genera which belong to the subfamily Formicinæ none is more striking than the singular Indo-Malayan genus Myrmoteras. The ants of this group possess enormous, reniform eyes, a character found in other ancient genera, and in addition, show a curious occipital fold and a mandibular structure unique among the Formicinæ. The mandibles are linear, greatly elongated and with a number of sharp, well-separated teeth along their inner border. The mandibles themselves are consequently not unlike those of the primitive Ponerine genus Myrmecia. The mandibular mechanism taken as a whole is, on the contrary, totally dissimilar to that of Myrmecia, being closely analogous to a type found in the highly developed Ponerine genera Anochetus and Odontomachus and the peculiar Myrmicine genus Strumigenys. This blending of primitive and specialized characters in Myrmoteras is sufficiently unusual to repay careful consideration.

It has been observed that many of the species in the three genera just mentioned utilize the mandibles in a form of leaping to which Wheeler has applied the term retrosalience. The type of mandibular structure upon which retrosalience depends, although differing widely in detail, is remarkably uniform as regards fundamental organization. In all the known retrosalient forms the mandibles are linear and inserted close together. This results in a marked narrowing of the front of the head. The occipital angles have undergone linear or lateral expansion or both, apparently to permit the attachment of a large number of mandibular muscles. There has been developed a trigger mechanism consisting of two or more hairs which project forward and slightly downward. The details of this rather complex mechanism, on the other hand, are exceedingly variable. Thus

[1] Contributions from the Bussey Institution, Harvard University No. 336.

in Odontomachus (Fig. 1, C) and most of the species of Anochetus (Fig. 1, D) the dentition of the mandibles is ordinarily reduced to two or three stout, apical prongs. The other teeth, if present, are represented by small denticles along the inner border of the mandibles, which meet but do not overlap, just as do the cutting edges of a pair of electrician's pliers. The occipital angles have been produced through linear expansion into two prominent lobes. The trigger hairs are usually four in number, two hairs arising near the base of each mandible. These are brought into an effective position only when the mandibles are wide open. In contrast to this we find in Strumigenys (Fig. 1, A) that the mandibles are much more slender than those just described. Although the apical prongs are similar the inner edges of the mandibles do not meet and in some species bear widely separated teeth which may approach the apical prongs in size. The occipital angles have undergone both linear and lateral expansion which has resulted in the production of the cordate head characteristic of Strumigenys. The trigger hairs, when present, are two in number and arise from the lower edge of the labrum which hangs perpendicularly from the clypeus between the insertion of the mandibles. In certain species the base of the mandible is hollowed to permit the reception of the edge of the labrum. In some of the species of Strumigenys the trigger hairs are absent. This is true of *S. cordobensis* Mayr and apparently of *S. godeffroyi* Mayr also. It seems possible that this absence of trigger hairs may explain why certain members of this genus, although otherwise identical with the retrosalient species, have never been observed to leap.

As has already been noted the cephalic characters of Myrmoteras (Fig. 1, E) are very similar to those described above. The unusually long and slender mandibles are inserted relatively close together. The occipital angles are laterally expanded. There is a trigger mechanism consisting of two very long and exceedingly thin hairs which arise from the forward edge of the labrum. This structure in Myrmoteras is closely applied to the under side of the clypeus and lies entirely above the mandibles. The basal portion of the trigger hairs slopes forward and downward so that the hairs lie beneath the mandibles to which they are parallel throughout most of their length. The above similarities have been taken as an indication that Myrmoteras is a retrosalient form and such a conclusion appears to be amply justified. Unfortunately the almost complete lack of field observations on the ants of this genus leaves us without definite proof of this habit but, as will be subsequently shown, although Myrmoteras may not display this trait, there can be little doubt that it should be classed with a number of other genera which

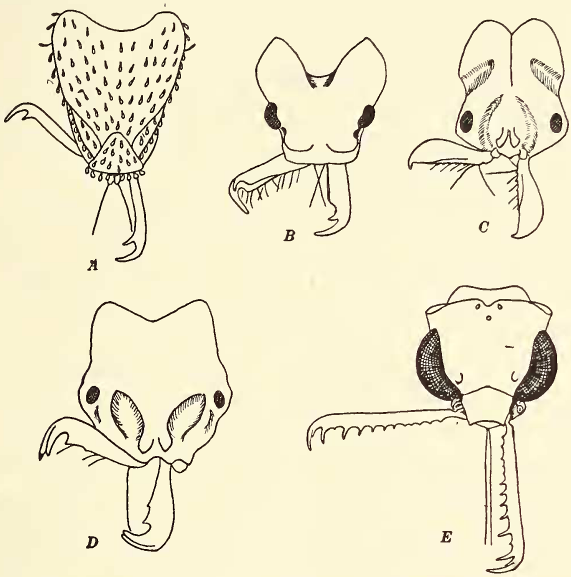

Figure 1. Diagram showing the relation between the length of the trigger hairs and that of the mandibles. A. *Strumigenys gundlachi* Roger. B. *Daceton armigerum* Perty. C. *Odontomachus hæmatodes* subsp. *laticeps* Roger. D. *Anochetus mayri* Emery. E. *Myrmoteras mjoebergi* Wheeler.

might be characterized as trap-jawed. This group would include the retrosalient genera mentioned above and also Daceton, Acanthognathus, Orectognathus, Microdaceton and Epitritus. The heads of representative forms of some of the above genera are shown in Fig. 1. As may be seen from this figure there is a correlation between the length of the trigger hairs and the length of the mandibles. The tendency of the hairs to curl when dry makes it difficult to obtain exact measurements but in general it may be stated that the tips of the trigger hairs reach a point greater than one-half and less than six-sevenths of the distance from the base to the apex of the mandibles when the latter are closed. This insures that the external object which springs the trap will be within the grasp of the closing mandibles and should be impaled on the apical prongs.

That the above result is the primary function of this type of mandibular mechanism appears fairly certain. In the retrosalient species however the same mechanism occasionally operates to produce backward leaps of the insect. This process has been described by a number of observers, particularly in the case of Odontomachus, which may be regarded as the exemplar of this type of leaping. The action is essentially as follows:

Prior to the leap the mandibles of the insect are opened to their greatest extent so that they stand at right angles to the long axis of the head or are directed slightly backward. At the same time the antennæ are held in such a position that their tips project forward and inward. Upon the contact of these with some external object the insect suddenly advances and when the trigger hairs touch the object the mandibles are snapped against it with the resulting backward leap of the insect.

Although this process has been repeatedly described very little attention has been paid to the mechanics involved. This may be because the action appears fairly obvious but is probably more largely due to its extreme rapidity which makes it impossible to follow the movements of the mandibles. A consideration of the mechanics of retrosalience must consequently be derived largely from the structure of the parts involved coupled with what can be observed of their action at the time of leaping. Such a study leads to a number of interesting conclusions. I am indebted to Dr. Gerald Almy for his helpful suggestions in the following discussion:

Observable facts in the leaping of retrosalient forms indicate that the process might be carried out in two ways. It is possible that the mandibles might be brought against some small, hard object with a scissor-like action in which the pressure would be applied by the inner edge of each mandible as these slipped along the object. This *modus operandi* would require tremendous pressure to produce an effective leap and would be defeated by the occurrence of teeth along the inner border of the mandible. Since these are always present, although sometimes reduced to two terminal hooks, this explanation may be discarded. The alternate explanation assumes that the tips of the mandibles are driven against some hard object which is too large to be included in their grasp. The tips then slide over the surface of the object and the ant is thrown backward. This process, if repeated many times would tend to wear down the terminal teeth since these are the only part of the mandible in contact with the object. It is by no means unusual to find specimens, particularly in the case of Odontomachus, in which the terminal teeth are blunted with the worn surfaces heavily scratched. If the above explanation is correct retrosalience depends as much upon the size and consistency of the object struck as upon the mandibular organization of the ant. In view of the habits of the retrosalient forms this fact is of considerable significance. Wheeler[2] has drawn a vivid picture of the ferocity with which the workers of Oodontomachus attack and dismember living insects placed in their nests. The appendages of the victims are at once nipped off by the plier-like jaws of the Odontomachus workers. The most casual inspection of the ants depicted in Figure 1 will show that this cannot be true of Strumigenys or Myrmoteras since the edges of the mandibles are not developed to permit a nipping action. Nevertheless the structure of the mandibles in each of these genera seems equally bound up with a trophic peculiarity. One of the few field observations which we possess for Myrmoteras was given me by Dr. Jas. W. Chapman who took *M. williamsi* in the Philippines. The specimens which he secured were slow and clumsy in movement. This is also true of every species of Strumigenys which the author has been able to observe. If we assume that the members of both these genera depend upon small and rather active insects for food the explanation for their peculiar mandibular organizations is at once apparent. While the efficacy of the mandibles as a cutting instrument would be nil they would function in the same manner as the jaws of a steel trap and by suddenly snapping

[2] A Study of Some Texan Ponerinæ. Biol. Bull. Vol. II, No. 1. 1900.

shut would impale insects whose agility would otherwise render them impossible of capture. It is interesting to note that there is an analogous type of trap mechanism in the angler fishes, (Lophiidæ) which enables them to capture other fishes more active than themselves.

The extraordinary parallelism in the mandibular organization of the various genera of ants mentioned at the beginning of this paper may be regarded as a case of convergence in response to a definite type of feeding habits. That the mandibles should also function in leaping is, I believe, entirely fortuitous. Practically all ants will, if sufficiently aroused, attack anything within reach. In the case of the retrosalient forms this attack, if the object bitten is of a suitable size and hardness, results in a backward leap of the insect. Although it is freely admitted that retrosalience serves at times to promote safety I am strongly averse to the view that this outcome has any fundamental significance in the ethology of the species. Escape under such circumstances differs in no way from that which occurs when an ant pursued by some predaceous enemy chances to tumble off a leaf and is thus accidentally removed from danger. To assume a more integral rôle for retrosalience necessitates the belief that the insects, when in danger, deliberately select some suitable object against which to strike the mandibles. In my opinion such a view is untenable.

If it is true that retrosalience is to be regarded as an ethological by-product we may amplify a concept advanced by Wheeler in a publication of 1922.[3] In this paper evidence was presented to demonstrate that prosalience, which is shown only by forms having elongated and thickened hind femora, is a characteristic confined to very primitive, macrophthalmic species. The large size of the eyes is apparently a necessary corollary to this type of leaping which might, as a further distinction to retrosalience, be called intentional. That prosalience plays a vital part in the ethology of the few archaic species which still show it is evident from Wheeler's remarks on Gigantiops. This ant, although conspicuous and a solitary forager, is able to

[3] Observations on *Gigantiops destructor* Fabr. and other leaping Ants. Biol. Bull. 1922, pp. 185–201.

escape capture by its agile leaps. The disappearance of prosalience in the great bulk of our present day Formicidæ Wheeler attributes to an increase in social organization which led to a decrease in the size of the eyes and a consequent readjustment of habits. Retrosalience on the other hand appears to be completely independent of habits or of the size of the eyes. It is fairly certain that the small size and peculiar position of the eyes in Strumigenys renders these insects virtually blind yet this lack of any means of visual orientation has not prevented the development of a trait in which this would seem to be of vital importance. Similarly in Odontomachus and Anochetus the value of the small eyes in orientation may be questioned. If, therefore, future field observations confirm the supposition that Myrmoteras is retrosalient it must be borne in mind that, although the ants of this genus are primitive and macrophthalmic, the trait of leaping is in this case a secondary development which has little or nothing to do with the primitive characters.

The genus Myroteras was established by Forel in 1893 from a series of workers taken in the Thaungyin Valley (Tennaserim), Burmah. This ant, to which he gave the name *binghami,* was for a number of years the only known representative of the genus. In 1916 Wheeler described the female of a new species, *M. donisthorpei,* from Borneo and three years later *bakeri* and *williamsi,* both described from females. The first species was taken in Borneo, the last in the Philippines. In the present paper the workers of two new species are described, *mjoebergi* from Borneo and *barbouri* from Java. A description of the worker of *williamsi,* which has hitherto been unknown is also given. A single female and two workers of this species were taken by Dr. Jas. W. Chapman at Dumaguette, P. I. These specimens Dr. Chapman generously turned over to me for examination and I wish to express my sincere thanks for this courtesy. A comparison of two castes shows that, except for the slightly longer mandibles of the worker, the cephalic characteristics are identical. This is of great importance in the separation of the described species, since two are known only from females while three have been founded upon workers. Since the difference between the head of the female and that of the worker is negligible a key based upon cephalic characteristics may include both castes. There is a single cotype of *binghami* in the collection of Dr. W. M. Wheeler, who has kindly allowed me to examine this species as well as the types of the species which he has described. It is possible, therefore, to present a review of the genus with the description of the new forms. I wish to thank Dr. Wheeler for his coöperation in permitting me access to the types and also for his consideration in turning over to me, for inclusion in this paper, the original description of the new species *mjoebergi*.

As might be expected of an archaic genus, whose members have, through isolation, become very distinct, the species of Myrmoteras show conspicuous differences in the shape of the head, the length of the antennal scapes, the number of mandibular teeth and the details of sculpture and pilosity. The following key presents an analysis of these differences:

KEY TO THE SPECIES OF THE GENUS MYRMOTERAS

1. Frontal furrow well developed, extending back to the median ocellus.........2
   Frontal furrow absent or represented only by an obsolete impression which does not extend behind the anterior third of the head.........5
2. Head opaque, completely coriaceous except the occipital fold......*williamsi*
   Head smooth and shining, the sculpture, if present, consisting of striæ on the front and clypeus.........3
3. Head entirely smooth.........*bakeri*
   Front and clypeus striate.........4
4. Mandibles with fourteen teeth, the denticles between the apical tooth and the penultimate tooth not well developed; length of the female 4.5 mm.........*donisthorpei*
   Mandibles with nine teeth, the denticles between the apical tooth and the penultimate tooth well developed; length of the worker 5.3 mm. *binghami*
5. Head completely smooth and very highly shining.........*mjoebergi*
   Head subopaque, finely and feebly coriaceous.........*barbouri*

Myrmoteras bakeri Wheeler

M. bakeri Wheeler, Bull. Mus. Comp. Zool. Harvard, Vol. 63, p. 145, (1919) ♀♂

In the original description of *bakeri* Wheeler surmised that it might prove to be nothing more than a form of *donisthorpei*. The specific status of *bakeri* can, however, scarcely be questioned. Although in size and general appearance the two forms are similar, *bakeri* is much paler, the front and clypeus bear no striæ and the dentition of the mandibles is quite different (see Plate 1, Fig. 5). The mandibles of *bakeri* have only nine teeth with three additional denticles borne singly between the terminal and second, the second and third and the third and fourth apical teeth. The integument in the type is translucent and because of this the frontal furrow and the circumocular grooves appear unusually prominent. Whether this translucence is constant for the species is open to doubt but, if so, it furnishes a very easy means of recognition. The color of *bakeri* is a clear, golden yellow with the mandibular teeth and the thoracic sutures tinged with red.

Type locality: Sandakan, Borneo (Baker).

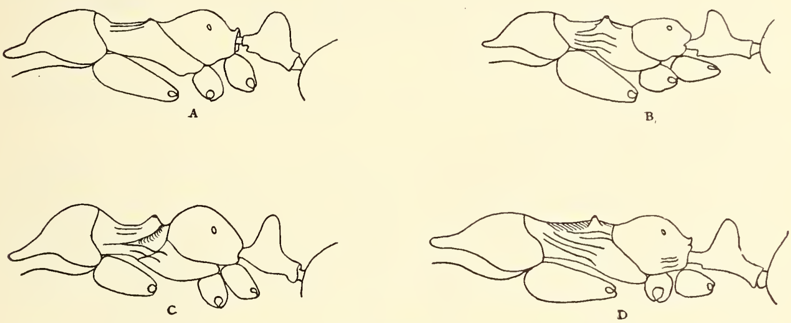

Figure 2. Thorax of the worker of: A. *M. mjoebergi* Wheeler, sp. nov. B. *M. binghami* Forel. C. *M. williamsi* Wheeler. D. *M. barbouri*, sp. nov.

Myrmoteras barbouri sp. nov.

WORKER: Length over all 6.9 mm.

Occipital fold deeply impressed in the middle, the ocelli borne on low and obtuse projections, a moderate concave impression between the lateral ocelli. Frontal groove virtually obliterated, represented only by a feeble impression which extends only a little way behind the level of the insertion of the antennæ. Mandibles with five apical teeth which gradually decrease in length and five small basal teeth. No denticles between the terminal tooth and the penultimate tooth. For other details of cephalic structure see Plate XI, Fig. 6.

Thorax seen in profile (Fig. 2, D) with the pronotum feebly convex, the mesonotum only moderately depressed, the tubercles bearing the mesothoracic spiracles prominent. Epinotum evenly convex, without distinction between the basal and declivious faces. Seen from above the pronotum is fan-shaped, one-fifteenth longer than broad (the neck excluded). Mesonotum only slightly more than one-third as wide as the pronotum, its sides approximately parallel. Epinotum subpyriform, slightly less than twice as wide as the mesonotum. Node of the petiole seen in profile with a blunt summit, both anterior and posterior faces sloping from crest to base, the posterior face slightly longer. Anterior and posterior peduncles of about equal length.

Ferrugineous, the mesonotum and epinotum slightly tinged with black, the petiole and abdomen brownish red, the mandibles antennæ and legs yellowish brown. The head covered with a delicate, subopaque coriaceous sculpture except for an oval area in the middle of the clypeus which is feebly striate and dull and the rim of the occiput, the occipital fold and the genæ which are smooth and shining. Pronotum moderately shining with very feeble coriaceous sculpture. Mesonotum with numerous strong irregular rugæ on the dorsum and five rugæ extending across the anterior half of the sides. Epinotum very feebly coriaceous, shining with fine wavy rugæ behind the spiracles and somewhat coarser rugæ on the lower portions of the sides. Hairs sparse, thin, erect and yellow.

Type: M. C. Z. No. 16231.

Described from a single worker taken by Dr. Thomas Barbour at Singdanglalia, Java.

Barbouri is the largest known member of the genus. Its characteristic cephalic sculpture readily distinguishes it from any of the other species with the possible exception of *williamsi*. In *williamsi* however, the sculpture is much heavier and more opaque and the two are totally dissimilar in size, shape of the head and dentition of the mandibles.

Myrmoteras binghami Forel

M. binghami Forel, Ann. Soc. Ent. Belg. Vol. 37, p. 607, (1893) ☿. Forel, Jour. Bombay Nat. Hist. Soc. Vol. 8, p. 419, (1894) ☿. Bingham, Fauna Brit. India, Hym. Vol. 2, p. 314, fig. 95, (1903) ☿. Emery, in Wytsman, Genera Insectorum Fasc. 183, Subfamily Formicinæ (1925) Plate 2, Fig. 1.

The front and clypeus of *binghami* are feebly reticulo-striate. This character separates it from all the other species except *donisthorpei* which has a similar sculpture. The pronounced difference in size, in the shape of the head and in the dentition of the mandibles prevents any possibility of confusion of these two species. The mandibles of the worker of *binghami* bear nine acute teeth, the basal four short, the apical five gradually increasing in length. Between the terminal tooth and the penultimate tooth are two well developed denticles, the more apical of these about twice as long as the inner. For other cephalic characters the reader is referred to Plate XI, Fig. 2.

In thoracic structure *binghami* (Fig. 2, B) closely approaches *barbouri* but differs in its more angular epinotum and less extensive mesonotal sculpture. The basal face of the epinotum is very feebly convex and separated from the much shorter declivious face by a well marked angle. The dorsum of the mesonotum lacks the conspicuous transverse rugæ which are present in *barbouri* and there are only four rugæ on the sides. The mesonotal tubercles are prominent but the spiracular openings themselves are quite small. The node of the petiole seen in profile has an almost perpendicular anterior face, a flattened summit and a straight and steeply sloping posterior face. Length over all: 5.3 mm.

Type locality: Thaungyin Valley, (Tenasserim) Burmah.

Myrmoteras donisthorpei Wheeler

M. donisthorpei Wheeler, Proc. New Eng. Zool. Club, Vol. 6, p. 14, fig. 3, (1916) ☿. Emery, in Wytsman, Genera Insectorum, Fasc. 183, Subfamily Formicinæ, Plate 1, fig. 16, (1925).

In *donisthorpei* the front and clypeus bear numerous fine wavy striæ. A similar condition is found in *binghami* but the striæ in that species are feebler and more broken up and the entire head is duller. The pronounced size difference in the two further eliminates any possibility of confusion. The mandibles of *donisthorpei* have the external border very feebly curved throughout. In this particular it appears to be unique in the genus. The inner border of the mandibles bear twelve teeth which gradually increase in length toward the apex. The denticles between the second and third and the third and fourth apical teeth are unusually well developed, being considerably larger than some of the basal teeth, consequently it is perhaps less confusing to regard the mandibles as having fourteen teeth rather than twelve as first stated. The customary two denticles are present between the apical tooth and the penultimate tooth but the innermost one is so small and closely applied to the base of the other that it is difficult to see. A figure of the head of the female of *donisthorpei* is given in Plate XI, Fig. 3. The node of the petiole of *donisthorpei* is moderately thick with a blunt summit which meets the almost perpendicular anterior face at a well marked angle but passes to the more sloping posterior face through a convex declivity. Length over all (female) 4.5 mm.

Type locality: Mt. Matang, (Sarawak) Borneo (G. E. Bryant).

The following description of the new species *mjoebergi* is that of Dr. W. M. Wheeler, through whose kindness I am able to present it here:

Myrmoteras mjoebergi Wheeler, sp. nov.

WORKER: Length 5–5.6 mm.

Very similar in form to the other species of the genus. Antennal scapes extending nearly two-fifths of their length beyond the posterior border of the head. Basal teeth of the mandibles longer and more distinct. In all there are ten teeth, counting the apical as the first. In the diastema between the first and second there are two denticles, the subapical being fully one-third as long as the apical, the other minute. A similar minute denticle is present in the diastema between the second and third and third and fourth teeth. Pronotum decidedly more rounded and convex than in *M. binghami* and *barbouri.* Base of the epinotum convex above, about twice as long as the declivity, which is straight and sloping. Petiole fully twice as long as broad, longer than high, the node thicker than in *binghami,* somewhat compressed laterally, in profile bluntly and evenly rounded above, its superior border from behind transverse and feebly arcuate. Appendages as in the other species, with the middle and hind tibiæ and the tips of the scapes incrassated.

Sculpture quite different from that of the other species, the whole body smooth and shining, with minute piligerous punctures, which are very inconspicuous on the head, thorax and abdomen and somewhat more numerous on the appendages. Concavity of the mesonotum indistinctly transversely striate.

Hairs white, delicate, erect, very sparse on the body, distinctly more abundant but somewhat shorter on the appendages. The funiculi, as in the other species, are clothed with erect hairs nearly as long as those on the scapes.

Castaneous brown; appendages yellow; mandibular teeth, tips of scapes, funiculi, bases of coxæ, extensor surfaces of legs, incisures of gastric segments and venter darker, reddish or yellowish brown.

Described from three specimens taken by Dr. E. Mjöberg on the summit of Mt. Tibang, Dutch Borneo, at an altitude of 1,700 meters. This is the third species of Myrmoteras to be described from Borneo which would seem to be the metropolis of the genus.

Mjoebergi is distinct from all the other species in the genus because of its highly shining surface which, except for a few very small punctures, is virtually free from sculpture. The longitudinal striæ of the sides of the mesothorax are reduced to two, one terminating directly in front of the spiracle, the other, which is shorter and more feeble, parallels the first and ends below and well to the front of the spiracle (Fig. 2, A). The mesothoracic spiracles are less conspicuous than in the other species, being borne on a broad, obtusely triangular elevation which gives them the appearance of being fused into the dorsum of the mesothorax. The frontal furrow is absent. The head of *mjoebergi* is shown in Plate XI, Fig. 1.

Myrmoteras williamsi Wheeler

M. williamsi Wheeler, Bull. Mus. Comp. Zool. Harvard, Vol. 63, p. 146, (1919) ☿.

WORKER (not before described): Length over all 3.9 mm.

Head as in the female (see Plate XI, Fig. 4) except that the mandibles are relatively longer, being approximately one and one-third times the length of the head, and bear two additional basal teeth. There are two small denticles between the apical and penultimate teeth and one larger denticle between the penultimate and third and the third and fourth teeth.

Thorax seen from above with the pronotum subspherical. The mesonotum is stalk-like, scarcely one-third as wide as the pronotum, its sides virtually parallel except posteriorly where they diverge slightly at the junction with the epinotum. Epinotum narrowed anteriorly, broader and with subparallel sides behind, its greatest width slightly less than one-half as wide as the mesonotum. Seen in profile (Fig. 2, C) the pronotum itself is only moderately convex but since the premesonotal suture is feeble and the transition to the steeply declivious and strongly depressed mesonotum is not sharply defined, the pronotum appears strongly convex. Mesothoracic spiracles borne on prominent tubercles. Mesoepinotal suture feeble on the sides but with a pronounced concave impression on the dorsum. Epinotum in profile strongly convex with the posterior face straight and sloping. Node of the petiole in profile with the summit rather narrowly rounded, the anterior and posterior faces very steeply declivious, the height of the node one and one-third times as great as the length of its base, the posterior peduncle slightly longer than the anterior and feebly expanded behind.

Head opaque, completely coriaceous, the antennal scapes and the base of the mandibles dull, with numerous fine punctures, the remainder of the mandibles strongly shining. Pronotum completely opaque, finely coriaceous, base of the first coxa finely coriaceous. Mesonotum shining with a few very coarse and widely separated striæ. Epinotum feebly coriaceous above but not completely opaque, the sides strongly shining. Petiole and gaster shining. Hairs on the head and thorax and abdomen short sparse and erect, somewhat more numerous and shorter on the appendages.

The above description is drawn from material secured by Dr. Jas. W. Chapman at Dumaguate, P. I. Since two workers and a female were taken it has been possible to compare the latter caste with the types of *williamsi.* Except that the head of Dr. Chapman's specimen is slightly darker the two are identical. This color difference is far too slight to be of any taxonomic significance.

It is unnecessary to describe in detail the female of *williamsi.* The head of this insect is shown in Plate XI, Fig. 4. The thorax is rather short and stout with the dorsum strongly convex. The pronotum, scutum, scutellum, basal face of the epinotum and the episternum are coriaceous and opaque. The sides and the declivious face of the epinotum and the metapluræ are covered with fine interrupted, feebly shining striæ. Wings smoky, iridescent in certain lights, the veins dirty yellow. In other regards as in the worker. Length over all 4.3 mm.

Localities: Los Banyos, Philippine Islands, (Type loc.) (F. X. Williams); Dumaguete, Philippine Islands, (Dr. Jas. W. Chapman).

Both the worker and female of *williamsi* may be readily distinguished by the coriaceous sculpture which renders the head completely opaque. An approach to this condition is found in *barbouri* but in the last species the sculpturing is not sufficiently heavy to cause complete opacity. Furthermore confusion of these two species is very unlikely because of the marked difference in size. The frontal furrow in *williamsi* is unusually prominent, extending from a point opposite the insertion of the antennæ back to the median ocellus. In the structure of the thorax the worker of *williamsi* differs notably from that of any of the other species in which this caste is known. The very strong depression of the mesonotum makes the pronotum and epinotum appear very gibbous. The concave impression at the mesoepinotal suture is apparently peculiar to *williamsi*. The characteristic sculpturing of the thorax has already been described.

PLATE XI

The figures are drawn to the same scale and can be used in comparing the size of the various species.

Figure 1. Worker of *Myrmoteras mjoebergi*, Wheeler.
Figure 2. Worker of *Myrmoteras binghami*, Forel.
Figure 3. Female of *Myrmoteras donisthorpei*, Wheeler.
Figure 4. Female of *Myrmoteras williamsi*, Wheeler.
Figure 5. Female of *Myrmoteras bakeri*, Wheeler.
Figure 6. Worker of *Myrmoteras barbouri*, Creighton.